

# APPALACHIAN RIVERS III CONFERENCE AND EXHIBIT

## OPENING REMARKS

by L. Zane Shuck,  
Co-Chair and Founder

*NOTE: Due to a death in Dr. Shuck's family, Dr. Jan Wachter gave the presentation for him. Below are Dr. Shuck's notes for the slides that were presented.*

Welcome to Appalachian Rivers III Conference.

Let me first thank my Co-Chairs, Jan Wachter and Dave Hyman for their many contributions in organizing this conference. I would like to extend a very special "thank you" to Betty Robey, Conference Coordinator, and her staff. Will Betty Robey, Lorraine Alvarez, Carolyn Moore, and Pam Stanley please stand and be recognized. They have done a fabulous job of coordinating all of the arrangements, from food, to registration and exhibits, to extensive communications with you, including audio-visual arrangements for presentations and panel discussions. Let's give them a big round of applause Thank you and many others within NETL for your kind hospitality in hosting the event again here in Morgantown this year.

The Appalachian Rivers conference is unique among river environmental and ecology conferences. Although the problems and features of streams and rivers and their ecosystems are discussed here, the focus is on the science and technology needed and used to study them. The emphasis here is the SCIENCE, METHODOLOGY and TECHNOLOGY, per se, for monitoring, analyzing, understanding, characterizing and modeling stream and river ecosystems, and diagnosing and mitigating their problems.

This conference is structured to bring everyone together in the same room at the same time to talk about the multi-disciplinary and interdisciplinary aspects of the complex, coupled phenomena associated with stream and river ecosystems. All of the players ranging from watershed stewards to equipment manufacturers are included so that everyone can gain a comprehensive understanding of the diverse issues in order to expedite the development, transfer and application of advanced technology. Perspectives and multi-disciplinary input are solicited from every sector, including watershed organizations, state and federal government agencies, academia, industry, consultants, and manufacturers. Input from all such sectors is essential, in order to systematically develop the greatly needed technology.

Today, I would like to present some overview thoughts about the technology available, the status of our basic science knowledge level of each ecosystem component, and make a case for a special R & D program to develop stream and river science and technology in a systematic manner. In fact, I refer to this as a "systems" approach to developing the multifaceted technologies needed for each of the ecosystem components and information integration. Continuous feedback as each technology is being developed for each discipline and ecosystem component is essential. For example, as greater ecosystem understanding and characterization are achieved the monitoring technology needed can be re-evaluated and adjusted. Likewise, each phase up through the problem mitigation phase should dictate the requirements to be met by each of the prior sequential phases beginning with monitoring and

progressing through analysis, characterization, diagnostics and assessments. This feedback approach needs to be employed for each component of the ecosystem which involves many disciplines.

What is the problem? Anyone who has attempted to interpret water quality and other data typically available for a stream has to be frustrated and disappointed. This is especially true if one is looking for diagnostic explanations for specific ecosystem conditions. The snapshot water quality data, for example, may tell you how bad a stream was on a given day and hour for a few pollutants and characteristics, such as pH, and what statutes are violated, but it does not tell you much about the health, stability or other internal conditions of the stream ecosystem. Flow rates and flow rate history, diurnal effects, prior rainfall history, solar radiation history, and numerous other extraneous variables are never known. Invertebrate data, water quality and other watershed data correlation cannot be done effectively, efficiently, or at all for many purposes. Thus, interpretation of data is very limited and impossible in most cases. A measure of our knowledge level of stream ecosystems rests upon our ability to quantitatively describe them using mathematical expressions, the biochemical, biophysical, mass transport, energy, food chain, and other processes and behaviors of stream ecosystems. Currently, the most appropriate type of expressions when combined are usually referred to as bioenergetic models that have been applied to ponds or aquaculture. However, the basic science knowledge, or the data, are not available to construct such models for stream and river ecosystems. We do not have the necessary understanding to even develop good diagnostic tools, yet we are in the business of having to develop empirical TMDL models or requirements for streams to meet as a stopgap measure. In addition, we are in the process of developing mitigation technology as a best effort, stopgap measure without comprehensive knowledge or understanding of the ecosystem being treated. The implications of inappropriate TMDL's now being developed for every stream in the United States can have huge future impacts on both our economy and river ecosystems. Our long-term fundamental quality of life actually hinges upon our knowledge and understanding of local watershed ecosystems and streams as resources. Yet our knowledge base, methodology, and technology levels are somewhat comparable to that in the 40's or 50's when compared to other related technologies such as those developed for humans.

This is analogous to trial and error diagnosis and treatment of various system components of the human body, such as, the heart, brain, kidneys, liver, digestive tract, etc. without understanding the individual biochemical, bioelectrical, and biophysical functions and compositions, and their interdependent holistic roles within the body, and without the diagnostic tools available in every clinic or small hospital today. We need to reexamine our priorities and our entire approach to stream monitoring, analysis, modeling, and problem mitigation. The processes should not be driven by legal or emotional forces, or collective opinions, but rather, science and technology. We need to develop the basic science, technology, and methodology so that we can understand the stream ecosystems, know what we are doing, and do it in an efficient manner. In the long run, the costs to both our economy and stream ecosystems, and ultimately our quality of life, will be less.

Why is stream and river technology lagging so far behind applications in other fields? There is one simple, major reason. The forces driving stream and river ecosystem technology development are miniscule. Unlike the human medical profession, the major development force of economic incentives is absent. The market does not exist. Even government programs to specifically develop stream ecosystem science and technology do not exist! Local and federal government agencies are too burdened with meeting their legislated missions to focus on technology development. The small market is insufficient for manufacturers to focus upon it, or commit R & D resources to it. Small university research projects are currently the leading contributors, except for some water quality monitoring instruments developed for broad, general purposes that have very limited applications to

the needs for stream and river monitoring. Their capabilities are too limited, too labor intensive, and the cost is too high for extensive application.

So, what can we do about this problem? How can we get everyone on the same page and properly informed on these complex issues? What approach should we use? What would you propose as a solution? To seek answers to these questions and facilitate the process toward a solution is the principal reason I founded the Appalachian Rivers Conference over three years ago.

I submit that, as important as our economy and stream ecosystems are to our quality of life in the United States, a special federal government R & D program is not just warranted or justified, but essential, and should be a high priority in our national budget. It is a proper role for our federal government to develop technology to solve problems that greatly impact such important facets of our lives and our country, as our economy and environment, that otherwise is not being, or would not be, developed because of insufficient incentives from the private sector.

As a start, I propose today an R & D program concept for you to consider. Since the problem is highly multi-disciplinary, and involves a broad spectrum of sophisticated research, river steward needs, hardware and software development, equipment manufacturing, and many government agency activities, a solution to the problem must engage and include representation and participation by all of the parties. Currently, much of the related research is being done through very small grants to universities. Thus, I propose a program as follows:

#### **BUDGET, MANAGEMENT & ORGANIZATION**

**Budget & Term:**    \$20 million per year for a total of 5 years

**Organization:**

|                                      | Million \$/Yr Each | Total Program Million \$/Yr |
|--------------------------------------|--------------------|-----------------------------|
| 6 Universities * -----               | 1.5                | 9                           |
| 10 Appalachian States -----          | 0.5                | 5                           |
| 5 Manufacturers* -----               | 1.0                | 5                           |
| 1 Program manager organization ----- | 1.0                | <u>1</u>                    |
|                                      |                    | TOTAL ----- 20              |

\* Competitive selections and reviews with cost sharing

Whether this concept ever gets implemented will depend upon you, and your efforts to communicate the need and justification for it to our country's leaders. We can discuss this at length at this conference. Hopefully, you will leave this conference motivated to pursue every way possible a special federal government stream and river science, research and technology development program.

Regardless of the specific government R & D program characteristics, at this time we need strong advocates and proponents to champion the cause.

I certainly welcome any thoughts or suggestions any of you have on these ideas. Now, I look forward to discussing these issues with you, and hearing the presentations and panel discussions.

Once again, thank you so very much for your participation, and I hope you enjoy Appalachian Rivers III Conference.